



MXi: A High-Performance x86 Processor with Integrated 3D Graphics

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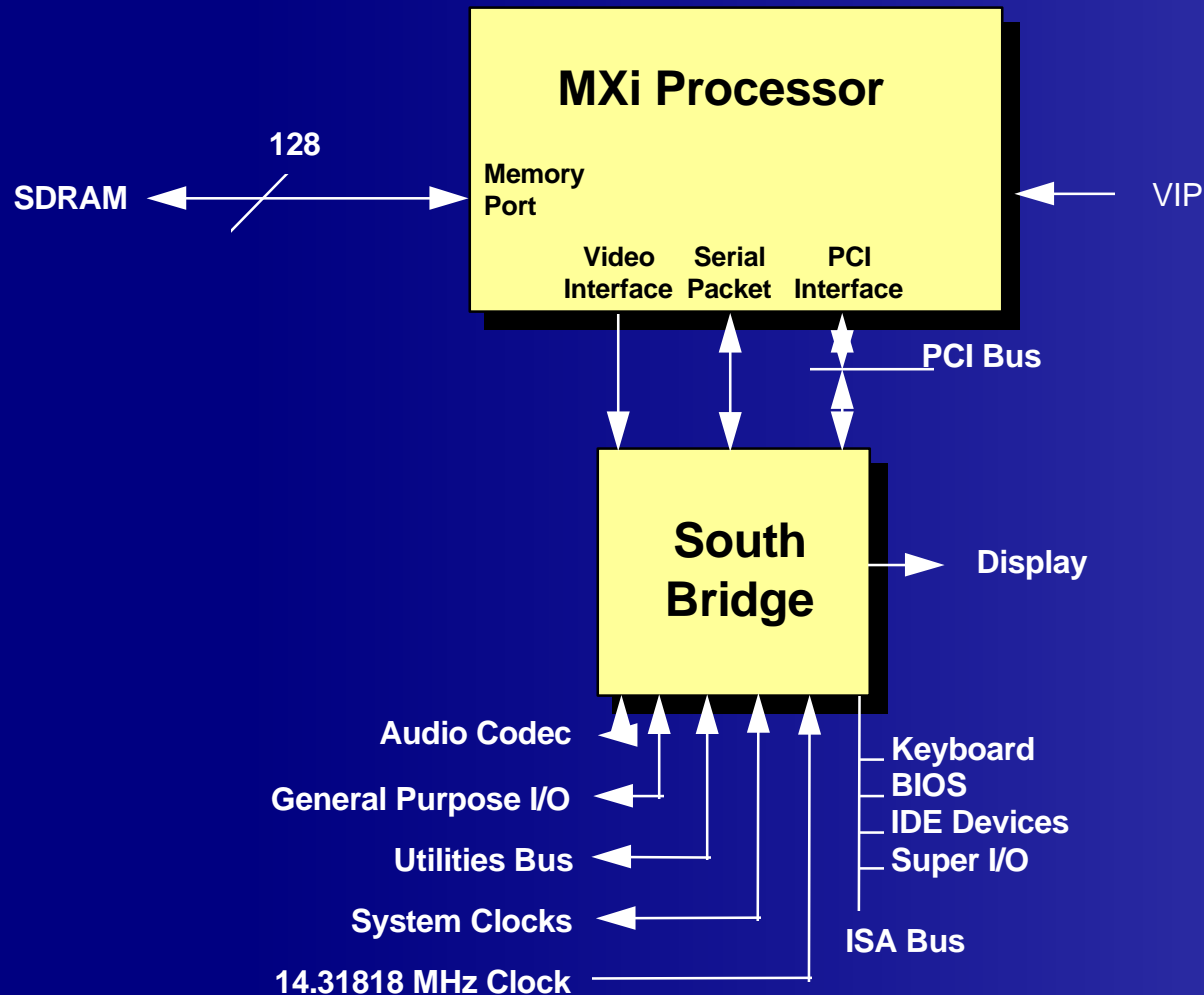
MXi Objective

- ◆ **Develop the next-generation integrated processor for the mainstream multimedia desktop in 2H`98**

MXi Architectural Features

- ◆ Next-generation Cayenne core
- ◆ Integrated high-performance 2D, 3D, and DVD
- ◆ Integrated SDRAM interface with greater than 2GB/sec memory bandwidth and low latency
- ◆ Greater than 4x integrated AGP
- ◆ 66 MHz PCI

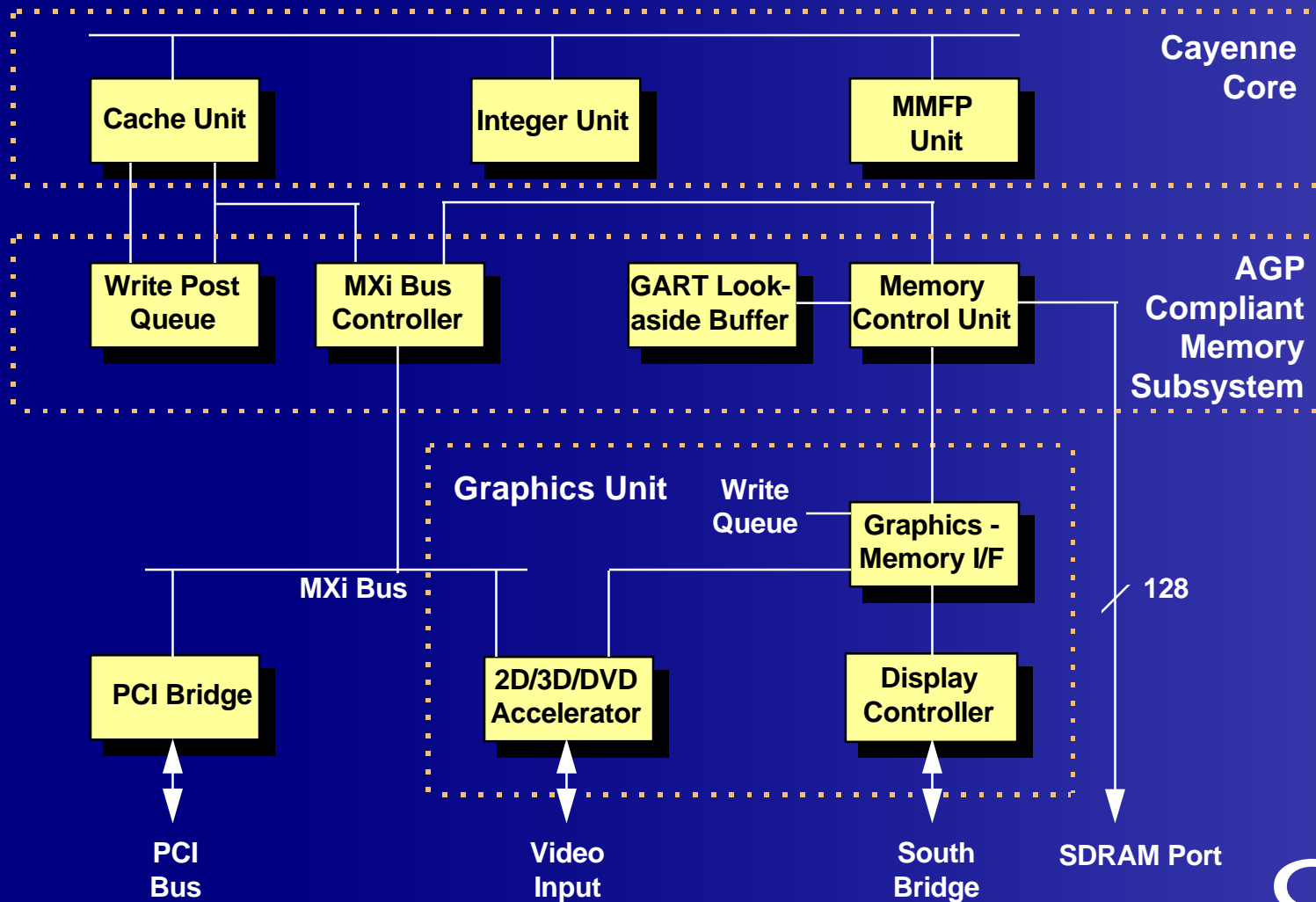
MXi System Block Diagram



MXi Cayenne Core Features

- ◆ High-performance multimedia floating point (MMFP) processing
- ◆ Dual-issue, pipelined MMFP Instruction Unit
- ◆ 64KB unified cache
- ◆ 384 entry 6-way associative TLB
- ◆ 4MB page size extensions
- ◆ Virtual mode enhancements
- ◆ Virtualization support

MXi Processor Block Diagram



Latency/Throughput for FPU Ops

- ◆ Zero clock fxchg
- ◆ 4 clock latency and 1 clock throughput for all loads/stores/adds
- ◆ 4 clock latency and 1 clock throughput for single-precision multiplies
- ◆ 6 clock latency and 3 clock throughput for double-precision multiplies

MMFP Vectorization

- ◆ 15 new multimedia instructions
- ◆ Two single-precision floating point results per operation
- ◆ Dual-issue, including floating multiply and adds
- ◆ Load/store high/low and swap facilitate scatter/gather
- ◆ Fully pipelined

Latency/Throughput for MMFP Ops

- ◆ 1 clock latency and 1 clock throughput for all loads/stores
- ◆ 3 clock latency and 1 clock throughput for multiply and add
- ◆ 5 clock latency and 3 clock throughput for reciprocal and reciprocal square root
- ◆ Greater than 300MFlop sustained matrix multiplies
- ◆ Greater than 1GFlop peak performance

Integrated 3D Graphics Features

- ◆ Bi-linear and tri-linear filtering
- ◆ Alpha blending/fog
- ◆ Gouraud shading
- ◆ MIP mapping
- ◆ Perspective correct texturing
- ◆ Zbuffering
- ◆ AGP software compatibility
- ◆ High-performance pipelined triangle set up and pixel rendering

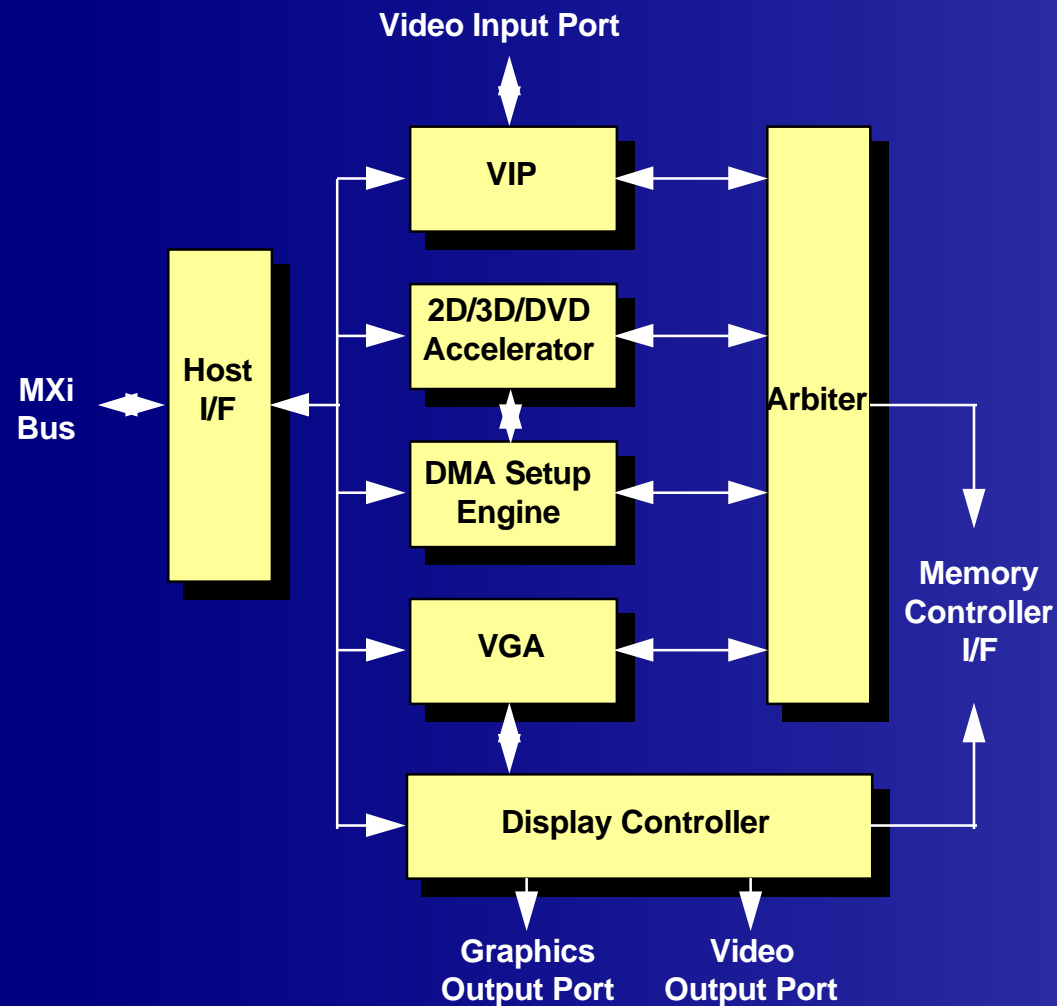
Additional Graphics Features

- ◆ Up to 1600 x 1200 resolution
- ◆ 2KB texture cache
- ◆ Flexible video input port supports VIP, VPORT, and zoom video
- ◆ Very high-performance 2D acceleration:
 - 1.6 Gpix/sec fill rate
 - 800 Mpix/sec/screen-to-screen BLT
- ◆ Direct3D compliant
- ◆ Fully VGA compatible

MPEG2/DVD Acceleration

- ◆ Consumer quality DVD playback with no external components
- ◆ Mediamatics MVCCA compatible motion compensation
- ◆ Full concurrency with host processor
- ◆ Video textures for multiple video windows
- ◆ Color-space-conversion, scaling, filtering, and blending with DVD subpicture

MXi Graphics Block Diagram



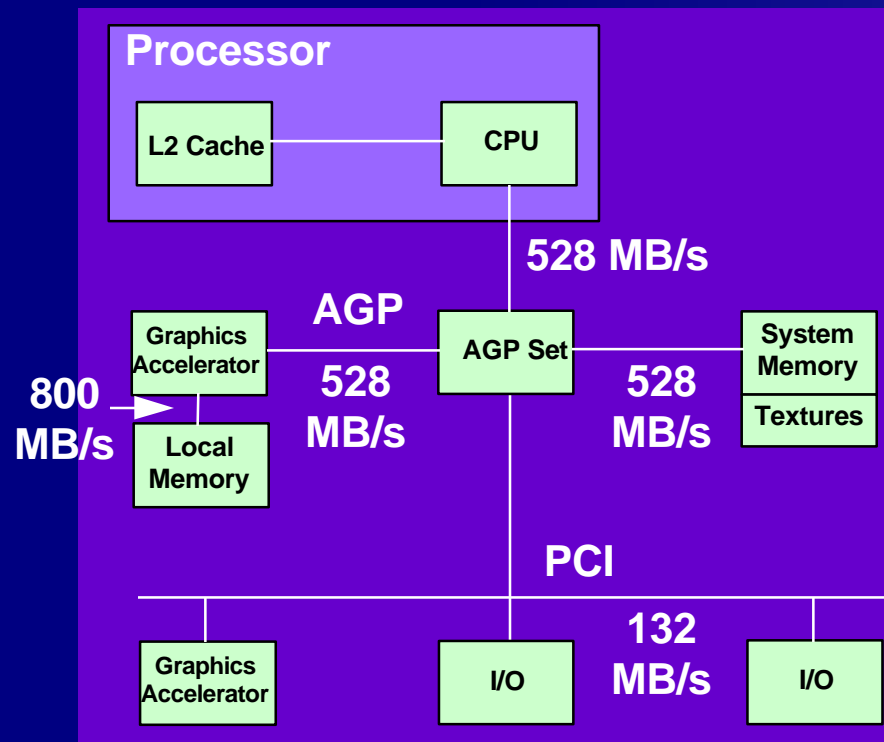
3D Graphics Performance

- ◆ **Greater than 2 million triangles per second**
- ◆ **Greater than 120 million pixels per second fill rate with:**
 - **Gouraud shading**
 - **Z buffering**
 - **Perspective correction**
 - **Bi-linear filtered texture mapping**
- ◆ **Greater than 4x AGP bandwidth**

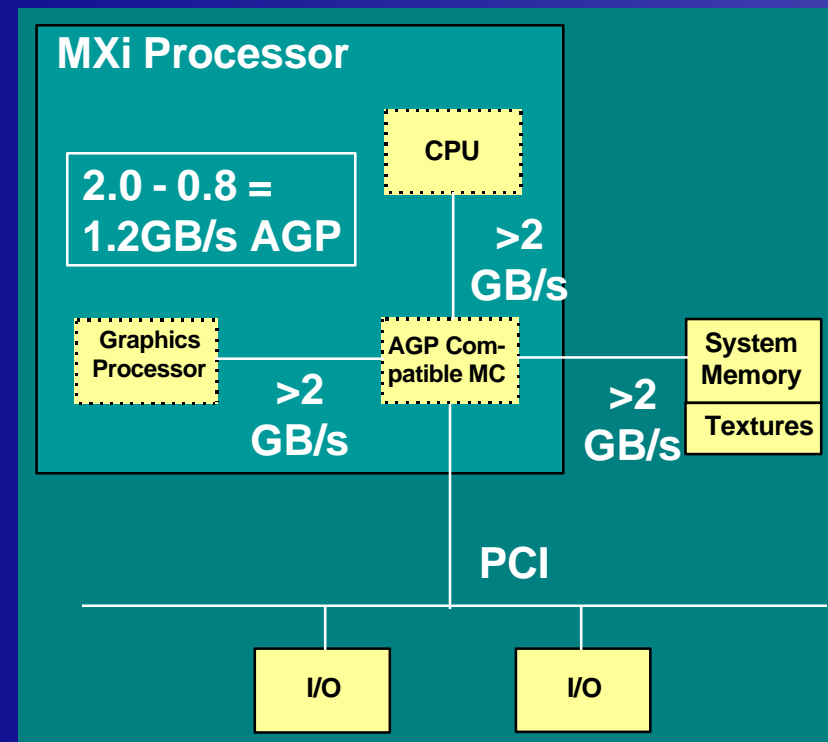
Memory System Interface

- ◆ Multi-ported memory control interface with 13 cache lines of write post queuing and tractable prioritized arbitration
- ◆ 256 entry 4-way set associative GLB
- ◆ 128-bit SDRAM interface
- ◆ Greater than 2GB/sec memory bandwidth
- ◆ Supports double-edge data rates
- ◆ Up to 16 open banks and up to 32KB pages
- ◆ Supports up to 8 pipelined requests

AGP Comparison



528MB/s = 2x AGP



1.2GB/s > 4x AGP

MXi Status/Stats

- ◆ Tape out 4Q`97
- ◆ Production 2H`98
- ◆ 9M transistors
- ◆ PR300 - PR400
- ◆ 90 sq. mm in 0.25 micron, 5 layer metal, C4 process

Summary

- ◆ **MXi delivers integrated, balanced, cost-sensitive, high-performance multimedia processing**
- ◆ **Dual-issue, pipelined MMFP unit with MMFP instruction enhancements**
- ◆ **Latest system technology including SDRAM, integrated AGP, 2D, 3D, and DVD**
- ◆ **Exceptional memory bandwidth and low memory latency**